day 30

$\frac{d}{dx}(x^n) = nx^{n-1}$ $\quad \frac{d}{dx}(fg) = f'g + fg'$ $\quad \frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$

$\frac{d}{dx}(e^{kx}) = ke^{kx}$

$\frac{d}{dx}(\sin x) = \cos x$

$\frac{d}{dx}(\cos x) = -\sin x$

$\frac{d}{dx}(\tan x) = \sec^2 x$

$\frac{d}{dx}(\cot x) = -\csc^2 x$

$\frac{d}{dx}(\csc x) = -\csc x \cot x$

$\frac{d}{dx}(\sec x) = \sec x \tan x$

3.5/57 $\quad y = (x\cos x)(\sin x)$ need 2 pieces

$\frac{dy}{dx} = f'g + fg' = \frac{d}{dx}(x\cos x)\cdot\sin x + x\cos x \frac{d}{dx}(\sin$

$f'g+fg'$ $\quad f\cdot g$

$= \left[\frac{d}{dx}(x)\cdot\cos x + x\frac{d}{dx}(\cos x)\right]\cdot\sin x + x\cos x(\cos x)$

$= \left[\cos x + x(-\sin x)\right]\cdot\sin x + x\cos^2 x$

$= \sin x\cos x - x\sin^2 x + x\cos^2 x$

Note $\frac{d}{dx}(f\cdot g\cdot h) = \frac{d}{dx}(fg)\cdot h + fg\cdot\frac{d}{dx}(h)$

$= (f'g+fg')h + fgh'$

$= f'gh + fg'h + fgh'$

Bin

$\frac{d}{dx}(cf(x)) =$

$\frac{d}{dx}(c)\cdot f(x) + c\cdot\frac{d}{dx}(f(x))$

Oct 3-3:23 PM

$\frac{d}{dx}(x^n) = nx^{n-1}$ $\quad \frac{d}{dx}(fg) = f'g + fg'$ $\quad \frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$

day 30

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3.5/63) $y = 1 + 2\sin x$; EOTL; $x = \frac{\pi}{6}$

$y' = 2\cos x$; $y'\left(\frac{\pi}{6}\right) = 2\cos\left(\frac{\pi}{6}\right) = \sqrt{3}$ (fn notation)

$y\left(\frac{\pi}{6}\right) = 1 + 2\sin\left(\frac{\pi}{6}\right) = 1 + 2\left(\frac{1}{2}\right) = 2$ (fn notation)

$y - 2 = \sqrt{3}\left(x - \frac{\pi}{6}\right)$

day 30

$\frac{d}{dx}(x^n) = nx^{n-1}$

$\frac{d}{dx}(fg) = f'g + fg'$

$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$

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$\frac{d}{dx}(\csc x) = -\csc x \cot x$

$\frac{d}{dx}(\sec x) = \sec x \tan x$

$\frac{d}{dx}(\sin^2 x) = \frac{d}{dx}\left((\sin x)^2\right) =$

$\frac{d}{dx}(\sin x \cdot \sin x) =$ Use product rule

$\sin^2 x \Big|_{x=\frac{\pi}{6}}$ means $(\sin x)^2 \Big|_{x=\frac{\pi}{6}}$

$= \left(\sin\frac{\pi}{6}\right)^2$

$\frac{d}{dx}(x^n) = nx^{n-1}$ $\quad \frac{d}{dx}(fg) = f'g + fg'$ $\quad \frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$ day 30

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$\frac{d}{dx}(\sec x) = \sec x \tan x$

3.5/49 d

$\sec x$ Not diff. at $x = \frac{\pi}{2}$?

$$\frac{d}{dx}(\sec x) = \frac{d}{dx}\left(\frac{1}{\cos x}\right) =$$

$$\frac{\frac{d}{dx}(1)\cdot\cos x - 1\cdot\frac{d}{dx}(\cos x)}{\cos^2 x}$$

$$= \frac{0\cdot\cos x - (-\sin x)}{\cos^2 x} = \frac{\sin x}{\cos x}\cdot\frac{1}{\cos x}$$

$= \tan x \cdot \sec x$ // not defined at $x = \frac{\pi}{2} \pm n\pi$

Oct 3-3:23 PM

day 30

$\frac{d}{dx}(x^n) = nx^{n-1}$ $\quad \frac{d}{dx}(fg) = f'g + fg'$ $\quad \frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$

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3.5/41) $y = x\sin x$

$y' = \frac{d}{dx}(x)\sin x + x\frac{d}{dx}(\sin x)$

$= \sin x + x\cos x$ ✓

$y'' = \frac{d}{dx}(\sin x) + \frac{d}{dx}(x\cos x)$

$= (+\cos x) + \left[\frac{d}{dx}(x)\cos x + x\frac{d}{dx}(\cos x)\right]$

$= +\cos x + (1)\cos x + x(-\sin x)$

$= 2\cos x - x\sin x$ ✓

Oct 3-3:23 PM

day 30

$\frac{d}{dx}(x^n) = nx^{n-1}$ $\quad \frac{d}{dx}(fg) = f'g + fg'$ $\quad \frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$

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$\frac{d}{dx}(\sec x) = \sec x \tan x$

3.5/56 $\quad y = \frac{\sin x}{1+\cos x}$

$$y' = \frac{\frac{d}{dx}(\sin x)(1+\cos x) - \sin x \frac{d}{dx}(1+\cos x)}{(1+\cos x)^2}$$

$$y' = \frac{\cos x(1+\cos x) - \sin x(-\sin x)}{(1+\cos x)^2}$$

$$= \frac{\cos x + \cos^2 x + \sin^2 x}{(1+\cos x)^2}$$

$$= \frac{1+\cos x}{(1+\cos x)^2} = \frac{1}{1+\cos x}$$

Oct 3-3:23 PM

$\frac{d}{dx}(x^n) = nx^{n-1}$ $\frac{d}{dx}(fg) = f'g + fg'$ $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$ day 30

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3.4/62) $f(x) = \frac{1}{x} = x^{-1}$

$f'(x) = (-1)x^{(-1)-1} = -x^{-2}$

$f''(x) = -(-2)x^{(-2)-1} = 2x^{-3}$

$f'''(x) = 2(-3)x^{(-3)-1} = -6x^{-4}$

$f^{(4)}(x) = -6(-4)x^{(-4)-1} = +24x^{-5}$

$f^{(5)}(x) = 24(-5)x^{(-5)-1} = -120x^{-6}$

Oct 3-3:23 PM

day 30

$\frac{d}{dx}(x^n) = nx^{n-1}$ $\frac{d}{dx}(fg) = f'g + fg'$ $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$

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3.4/72 $f(2) = 2$, $f'(2) = 3$

$g(x) = x^2 \cdot f(x)$

$g'(x) = \frac{d}{dx}(x^2) f(x) + x^2 \frac{d}{dx}(f(x))$

$= 2x f(x) + x^2 f'(x)$

EOTL at $x = 2$ $pt = (2, g(2)) = (2, 2^2 f(2))$

$= (2, 8)$

$g'(2) = 2(2) f(2) + (2)^2 f'(2)$

$= 8 + 4 \cdot 3 = 20$

$y - 8 = 20(x - 2)$

Oct 3-3:23 PM

$\frac{d}{dx}(x^n) = nx^{n-1}$ $\frac{d}{dx}(fg) = f'g + fg'$ $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$

day 30

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$\frac{d}{dx}(\sec x) = \sec x \tan x$

HW: 3.6 /1-8

[read § first]

3.4) 72b $h(x) = \frac{f(x)}{x-3}$

$h'(x) = \frac{\frac{d}{dx}(f(x))\cdot(x-3) - f(x)\frac{d}{dx}(x-3)}{(x-3)^2}$

$= \frac{f'(x)(x-3) - f(x)}{(x-3)^2}$

$h'(2) = \frac{(3)(2-3)-(2)}{(2-3)^2} = \frac{-5}{1} = -5$

Pt: $(2, h(2))$

$= \left(2, \frac{2}{2-3}\right) = (2, -2)$

Oct 3-3:23 PM

day 30

$\frac{d}{dx}(x^n) = nx^{n-1}$

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$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$

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Oct 3-3:23 PM